(12) UK Patent Application (19) GB (11) 2 090 651 A

(21) Application No 8040361
(22) Date of filing 17 Dec 1980
(43) Application published
14 Jul 1982
(51) INT CL³
F28F 1/10
(52) Domestic classification
F4S 4E2D 4F1
(56) Documents cited
GB 1500379
GB 1412442
GB 1403063
GB 490556
GB 457782
GB 424629
(58) Field of search
F4S
(71) Applicant
Pentagon Radiator
(Stafford) Limited,
Hixon Industrial Estate,
Hixon, Staffordshire,
ST18 0PY.
(72) Inventor
Eric Smith
(74) Agent
George Fuery & Co.,
Whitehall Chambers, 23
Colmore Row,
Birmingham, B3 2BL.

(54) Improvements Relating to Heat Exchangers

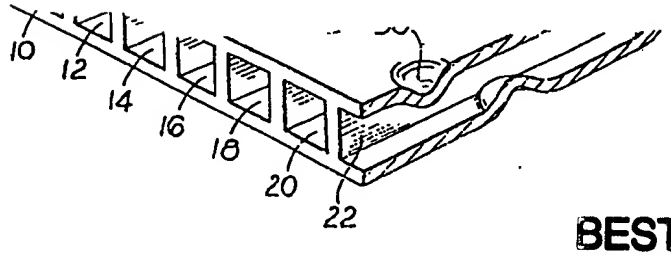
(57) A heat exchange tube, especially of the extruded multibore type, has a series of depressions (e.g. 24, 32) formed in opposite faces thereof such that the depressions project into the fluid conducting bores (e.g. 10, 12), the arrangement being such that the depressions in one face are staggered lengthwise relative to those in the opposite face whereby the flow passages in the bores 10, 12 are of a generally sinuous configuration.

ERRATUM

SPECIFICATION No. 2 090 651 A

Page 1, line 81, *after* Claims *insert* Filed on 16 Nov 81.

THE PATENT OFFICE
3rd August, 1983



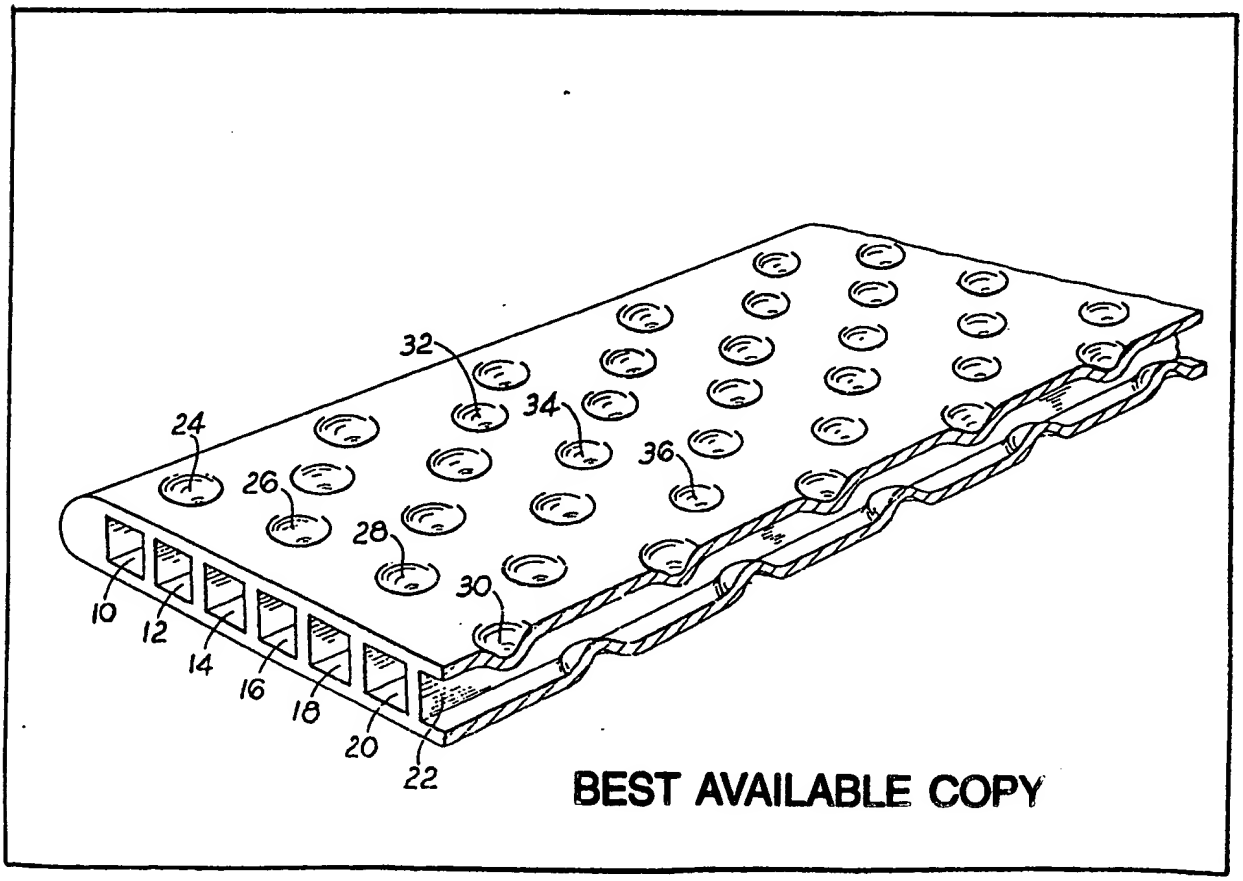
BEST AVAILABLE CO

(12) UK Patent Application (19) GB (11) 2 090 651 A

(21) Application No 8040361
(22) Date of filing 17 Dec 1980
(43) Application published
14 Jul 1982
(51) INT CL³
F28F 1/10
(52) Domestic classification
F4S 4E2D 4F1
(56) Documents cited
GB 1500379
GB 1412442
GB 1403063
GB 490556
GB 457782
GB 424629
(58) Field of search
F4S
(71) Applicant
Pentagon Radiator
(Stafford) Limited,
Hixon Industrial Estate,
Hixon, Staffordshire,
ST18 0PY.
(72) Inventor
Eric Smith
(74) Agent
George Fuery & Co.,
Whitehall Chambers, 23
Colmore Row,
Birmingham, B3 2BL.

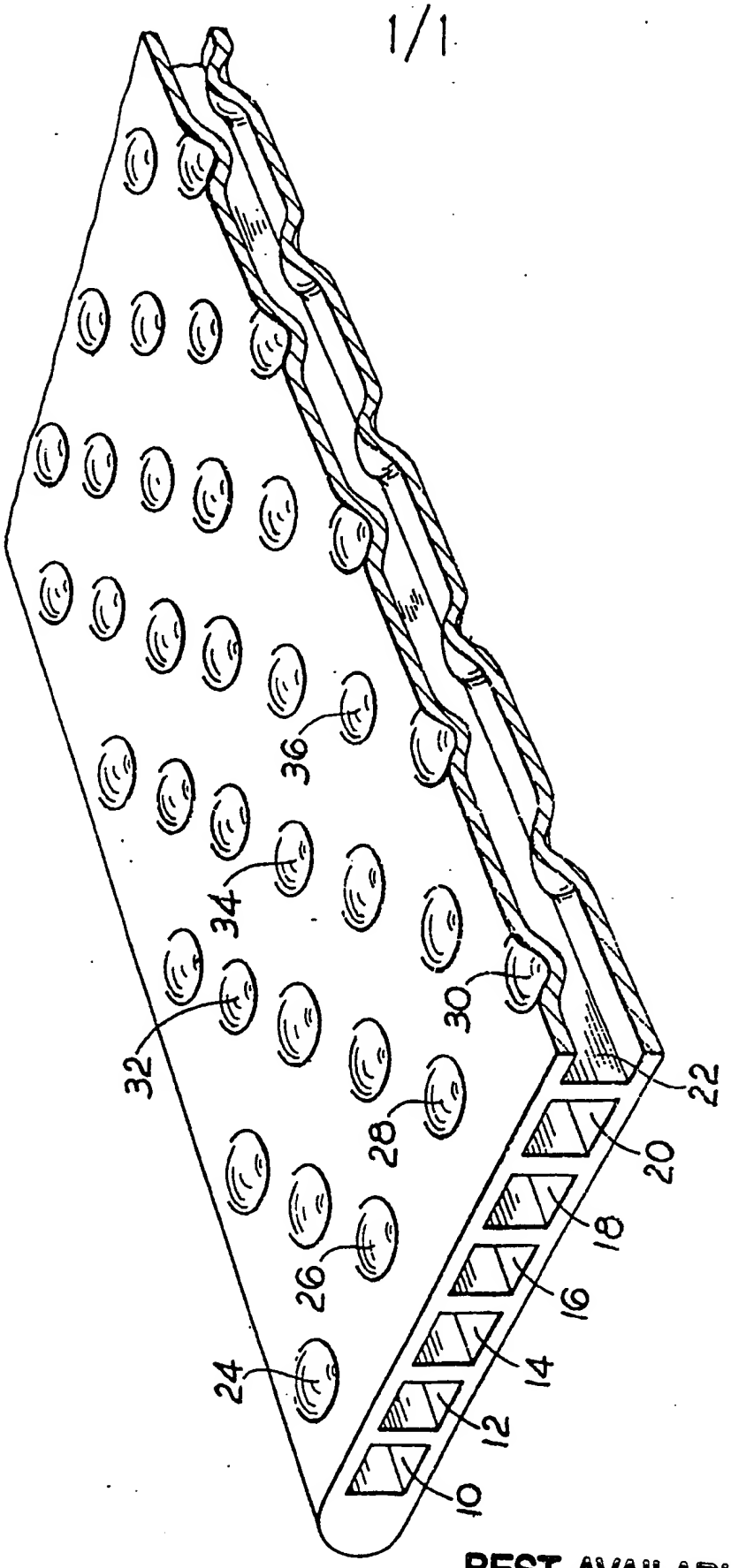
(54) Improvements Relating to Heat Exchangers

(57) A heat exchange tube, especially of the extruded multibore type, has a series of depressions (e.g. 24, 32) formed in opposite faces thereof such that the depressions project into the fluid conducting bores (e.g. 10, 12), the arrangement being such that the depressions in one face are staggered lengthwise relative to those in the opposite face whereby the flow passages in the bores 10, 12 are of a generally sinuous configuration.



BEST AVAILABLE COPY

GB 2 090 651 A



BEST AVAILABLE COPY

SPECIFICATION

Improvements Relating to Heat Exchangers

This invention relates to heat-exchangers. It is known to improve heat-exchange rate by using so-called turbulators. These consist of complex wound wire bundles inserted into the tubes of the heat exchanger. They work by increasing the turbulence in the fluid flowing in the tube and hence improving mixing of that fluid and by causing scouring of the tube wall by the fluid so as to avoid the formation of relatively static films of the fluid on the tube surface. However, they involve an additional cost, extra weight, and inevitably cause a pressure drop. The build up of scale or corrosion may also be a problem. It is therefore the object of the invention to provide similar effects in a simpler manner and avoid those difficulties.

In accordance with the invention broadly, a heat exchange tube has substantially planar and parallel walls which are alternately dimpled to form inward projections into the tube bore.

Hence, in use, the fluid is rendered turbulent by the projections.

Preferably, each dimple is large, that is to say it occupies a substantial proportion of the width of the wall. Further, the dimple may be relatively deep, that is to say project a substantial way toward the opposite and parallel wall, and the effect then, particularly when each dimple is appropriately spaced with respect to the dimples on the opposite wall, is to provide effectively a sinuous tube.

The invention has been found to be particularly convenient and efficacious with extruded multi-bore tubes, where the light alloy used for the extrusions has suitable ductility for the dimpling process, and the dimples can be provided by a rolling operation or by press operations, in an effective and economically efficient manner.

The invention has been applied experimentally in a heat exchanger of the kind described and illustrated in our prior Patent No. 1551106 using heat exchange tubes made by extrusion from light alloy with a plurality of parallel bores having their axes contained in a common plane (as illustrated by the reference numeral 44 in Figure 7 of the drawings of the said prior Patent). In such experiments, improvements in heat exchange as high as 40% have been achieved. It is to be appreciated that the invention is not confined to use in heat exchangers made according to said previous Patent.

The heat exchange tube according to the present invention is now more particularly described with reference to the accompanying drawing wherein the sole Figure is a perspective, part sectional view of the tube.

The tube has a plurality of parallel flow passages 10—22 which are here shown as of square cross-section. The dimples are arranged in transverse rows with the first, third, fifth etc. passages being dimpled in the first, third, fifth etc. rows as at 24, 26, 28, 30, and the second, fourth, sixth etc. passages are dimpled in the second, fourth, sixth etc. rows as at 32—34, 36.

The lower face (in the drawing) is dimpled in the reverse pattern so that where there is a dimple in one wall of a passage there is no immediately opposite dimple.

The dimples must not be so large as to unduly restrict flow of fluid in each passage, otherwise there will be substantial pressure drop. The spacing between the dimples and their arrangement, for example as shown, provides sinuous passages when the fluid alternately scours opposite walls.

The dimples may be of hemispherical shape, but some variation is possible for example by using wedge-shaped dimples.

Claims

1. A heat exchange tube having substantially planar and parallel walls which are alternately dimpled to form inward projections into the tube bore.

2. A heat exchange tube formed as an extrusion so as to have one or more fluid flow passages each bounded by a pair of spaced walls which face one another, characterised in that said walls are provided with a series of depressions which project into the or each passage such that, with respect to the passage, the depressions in one wall are staggered lengthwise relative to those in the facing wall.

3. A tube as claimed in claim 1 or 2 in which said dimples/depressions of each wall are arranged in rows extending perpendicularly of said passages with the dimples/depressions in each row staggered relative to those in the adjacent row or rows.

4. A tube as claimed in any one of claims 1 to 3 in which said dimples/depressions are formed by a rolling operation or pressing operations.

5. A tube as claimed in any one of claims 1 to 4 in which the dimples/depressions are of hemispherical shape.

6. A tube as claimed in any one of claims 1 to 4 in which the dimples/depressions are of wedge shape.

7. A heat exchange tube substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1982. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

BEST AVAILABLE COPY